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G4N  
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G08B

## (54) Plural direction vehicle tipping apparatus

(57) A load support structure which may be caused to tip in two, three or four directions comprises a chassis 1, a hydraulic ram 3 and a load supporting structure 2, selectively connectable to the chassis 1 at two or more hinge lines by respective hinges 5, 7, 8 each hinge being disconnectable to disengage the structure from the chassis at that location, each hinge being arranged to facilitate tipping of the load supporting structure about the respective hinge line, a detector being located at each hinge and being arranged to provide a signal indicative of connection of the structure to the chassis, and control means responsive to said signal adapted to actuate the ram only if the hinge or hinges of a single hinge line is connected.

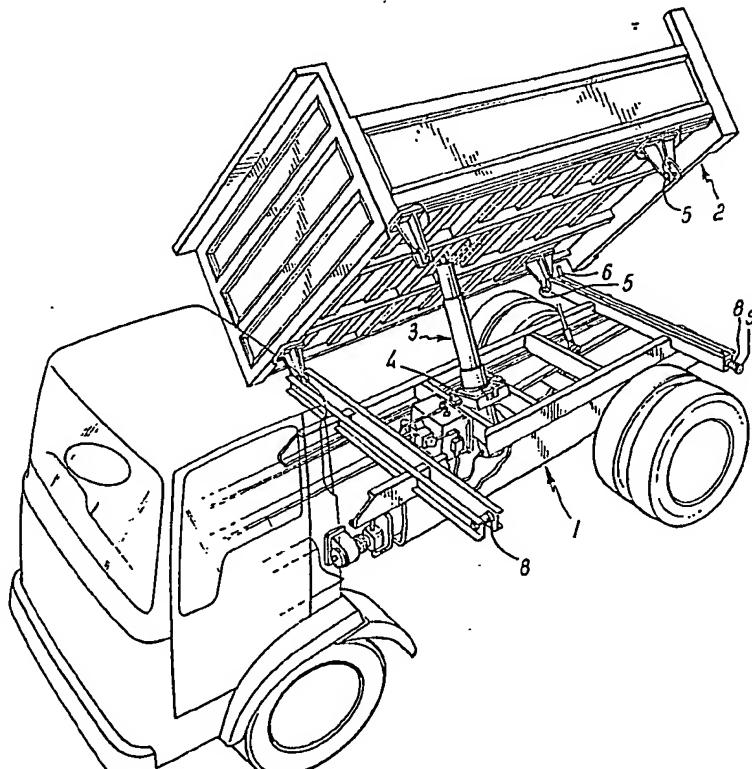


FIG. 1

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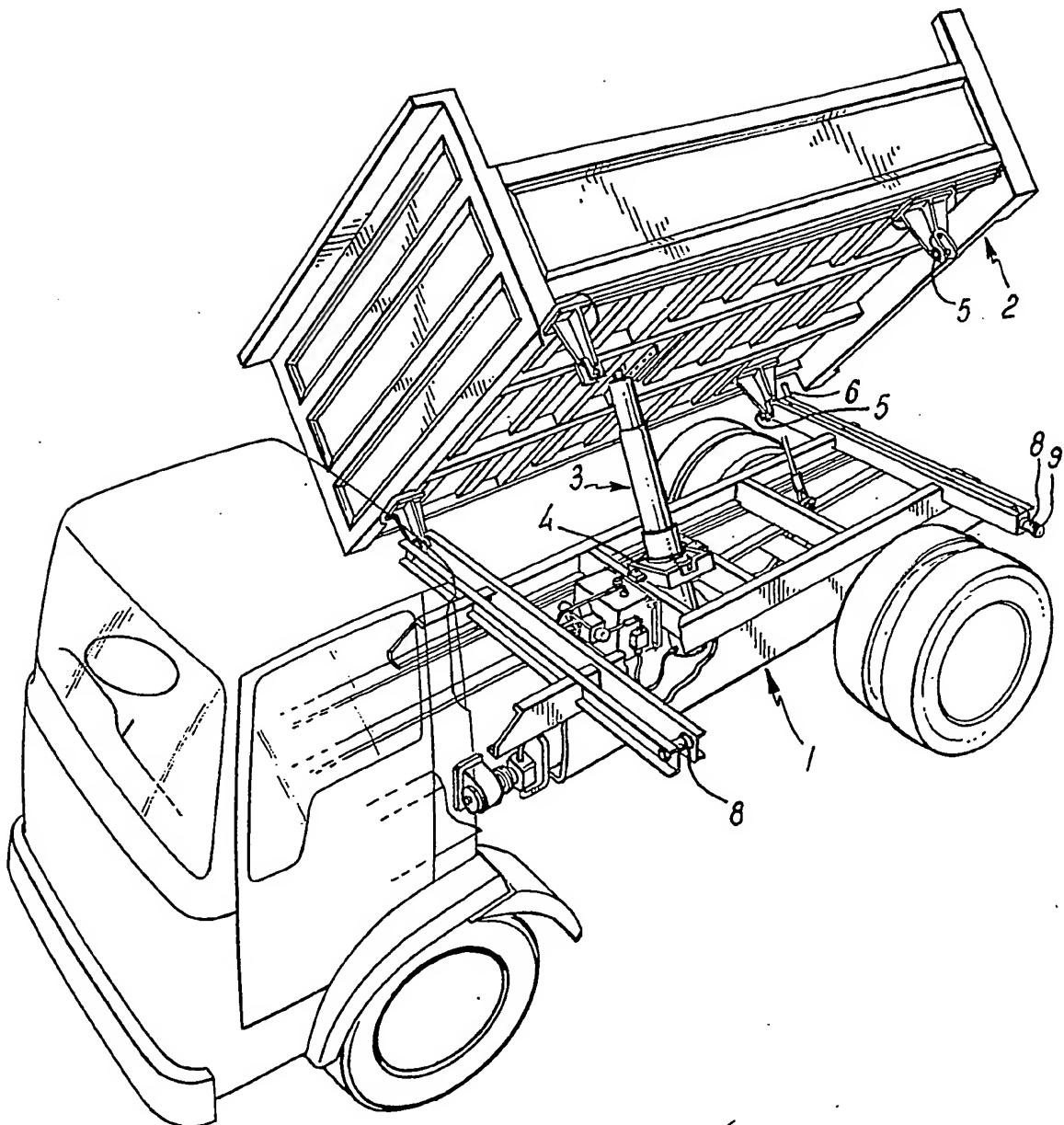
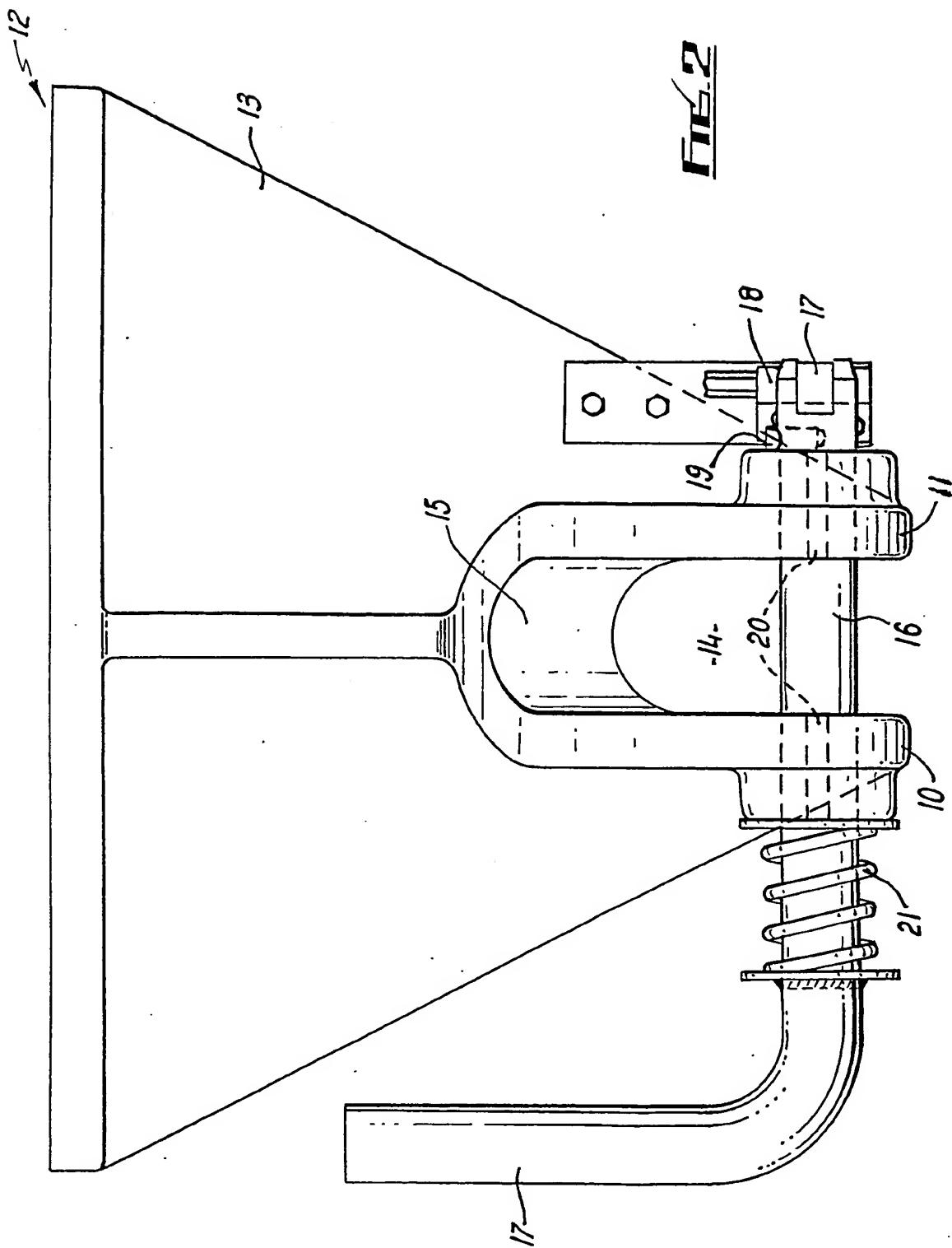


FIG. 1

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FIG. 2



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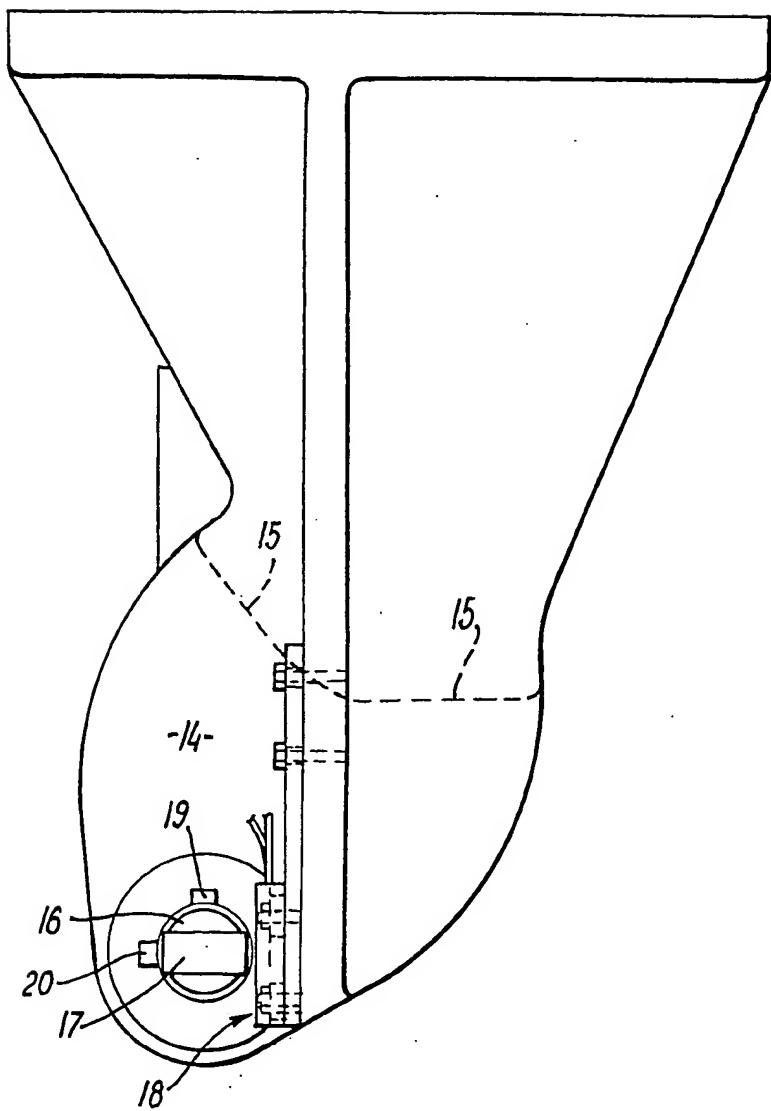


FIG. 3

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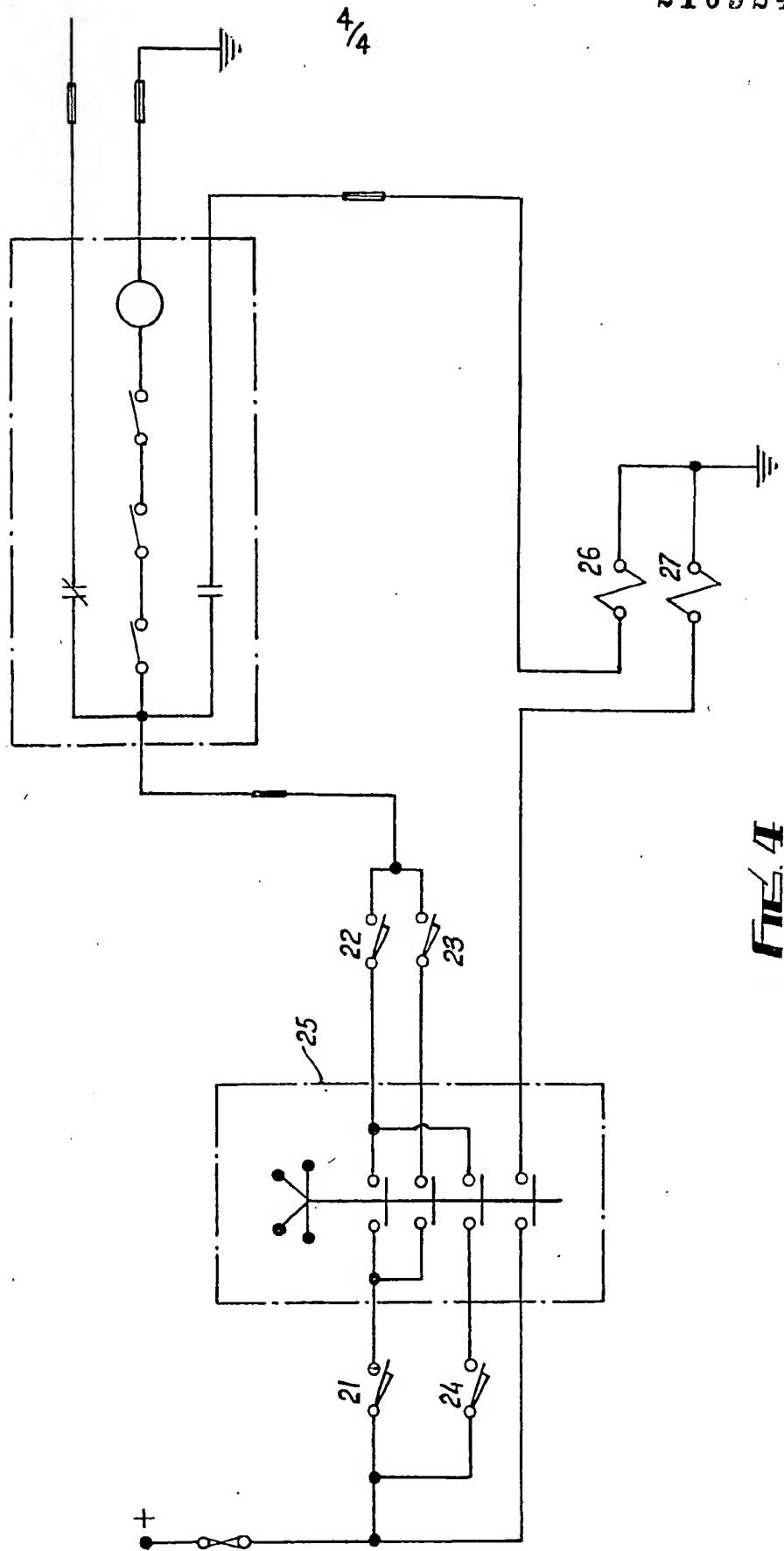


Figure 4

## SPECIFICATION

## Plural direction vehicle tipping apparatus

5 This invention relates to vehicle tipping apparatus in which a load support structure may be caused to tip in a plurality of directions. Such apparatus may be adapted to tip in two, three or four directions by appropriate arrangements of hinges. Those hinges  
 10 which are not required for tipping in a particular direction must be disengaged, otherwise considerable damage may be caused to the vehicle.

Use of differently sized locking pins in each hinge has been proposed but the smaller pins have been  
 15 found to be usable in the locations adapted to receive the larger pins, allowing an incorrect combination of pins to be engaged. Furthermore, this arrangement requires the provision of several different pins, loss of one of which may disable the  
 20 vehicle. Use of differently sized pins does not prevent accidental engagement of more than two hinges.

According to the present invention a plural direction vehicle tipping apparatus comprises a chassis, a  
 25 hydraulic ram and a load supporting structure selectively connectable to the chassis at two or more hinge lines by respective hinges, each hinge being disconnectable to disengage the structure from the chassis at that location, each hinge being arranged  
 30 to facilitate tipping of the load supporting structure about the respective hinge line, a detector being located at each hinge and being arranged to provide a signal indicative of connection of the structure to the chassis, and control means responsive to said  
 35 signal adapted to actuate the ram only if the hinge or hinges of a single hinge line is connected.

Apparatus in accordance with this invention is advantageous in that it is impossible to actuate the ram if an incorrect combination of hinges is connected. Furthermore the hinges may be identical, avoiding the difficulties incumbent upon provision  
 40 of four or more distinct hinge connecting arrangements.

The hinges of preferred embodiments of this  
 45 invention each include a pin which is removable to disconnect the load supporting structure from the chassis. A particular preferred embodiment is provided with means for locking the pin to the hinge and is further arranged to provide said signal only when  
 50 the pin is locked.

The detector may comprise a magnetically sensitive switch, arranged to be actuated by a magnet carried by the pin and arranged to be adjacent the switch when the pin is locked.

55 Alternative arrangements are possible, for example the locations of the switch and magnet may be reversed. Non-magnetic switches may be employed, for example the pin may create an electrical connection between contacts located on the hinge.

60 The invention is further described by means of example and not in any limitative sense, with reference to the accompanying drawings, of which:-

*Figure 1* is a perspective view of a vehicle in accordance with this invention;

65 *Figure 2* shows a hinge of the vehicle;

*Figure 3* is an end elevation of the hinge shown in Figure 2; and

*Figure 4* is a circuit diagram of the arrangement.

Figure 1 shows a vehicle constructed in accordance with this invention having a chassis 1 and load supporting structure 2. A hydraulic ram 3 is mounted upon the chassis by a universal bearing 4 and is connected to the approximate centre of the load supporting structure 2. Four hinges allow the load  
 70 supporting structure to be tilted rearwardly or to each side of the vehicle as the ram is extended. Each hinge comprises a stirrup 5 which may rest on a shaft 7, 8 mounted on the chassis. Insertion of a locking pin 6 through the stirrup connects the load  
 75 supporting structure to the chassis preventing disengagement from the shaft 7, 8 and forming a hinge.

The shafts 7 at the rear of the chassis extend laterally of the chassis to allow rearward tipping but the shafts 8 at the front of the chassis extend  
 80 lengthwise of the chassis to facilitate lateral tipping of structure 2. The rear shafts have terminal expanded portions, flanges or bosses to retain the stirrups thereon.

The structure of a rear stirrup is shown in greater detail in Figures 2 and 3. The stirrup comprises two legs 10, 11 carried by a mounting plate 12 and supporting web 13. The socket 14 between the legs forms a curved cam surface 15 which rests upon the shaft when the hinge is connected. The cam surface  
 95 15 allows the stirrup to tilt on the shaft in the direction of the page as shown in Figure 3.

A locking pin 16 having a handle 17 may be inserted through apertures in the legs 10 to prevent disengagement of the shaft from the stirrups. A slot  
 100 in the end of the pin 16 carries a magnet 17. A magnetically actuated switch 18 is situated adjacent the location of the end of the pin and is arranged to detect the magnetism of the magnet and to generate a signal.

105 The pin 16 carries a lateral stud 19 which passes through slots 20 in the legs of the stirrups when the pins is inserted. The pin may be locked into the stirrup by rotation through a convenient angle, e.g. 90°, preventing withdrawal of the stud 19.

110 A spring 21 causes the stud 19 to bear tightly against the leg 11. The latter may have a recess or other stop to prevent the pin from being accidentally dislodged from the locked position.

The slot in which the magnet 17 is carried causes  
 115 the latter to create a directional magnetic field so that the switch 18 is only actuated when the pin is rotated into the locked position.

Figure 4 shows the arrangement of the electric circuit. The four magnetic switches associated with  
 120 the rear left and right and front left and right hinges are shown at 21, 22, 23 and 24 respectively. A four position joystick-type control 25, located in the cab of the vehicle is used to actuate the hydraulic ram via "raise" and "lower" solenoids 26 and 27 respectively. The ram is only actuated when a correct pair of switches i.e. 1 and 2, 1 and 3 or 2 and 4 are actuated. Actuation of a different combination of switches or of one or more additional switches cannot actuate the ram.

130 The load support structure may comprise a con-

ventional container for soil or other material. Alternatively the structure may be flat, not having sides or may be a specialised container for example for garbage.

5 In alternative embodiments of the invention the pins may be connected or disconnected from the hinges mechanically rather than manually, for example by means of hydraulic actuators.

## 10 CLAIMS

1. Plural direction vehicle tipping apparatus comprising a chassis, a hydraulic ram and a load supporting structure selectively connectable to the chassis at two or more hinge lines by respective hinges, each hinge being disconnectable to disengage the structure from the chassis at that location, each hinge being arranged to facilitate tipping of the load supporting structure about the respective hinge line, a detector being located at each hinge and being arranged to provide a signal indicative of connection of the structure to the chassis, and control means responsive to said signal adapted to actuate the ram only if the hinge or hinges of a single hinge line is connected.

2. Apparatus as claimed in claim 1, wherein the hinges each include a pin which is removable to disconnect the load supporting structure from the chassis.

30 3. Apparatus as claimed in claim 2, including means for locking each pin to the respective hinge, arranged to provide said signal only when the pin is locked.

4. Apparatus as claimed in any preceding claim, 35 wherein the detector comprises a magnetically sensitive switch arranged to be actuated by a magnet carried by the pin, the magnet being arranged to be adjacent the switch when the pin is locked.

5. Plural direction vehicle tipping apparatus substantially as hereinbefore described with reference 40 to the accompanying drawings.

6. A vehicle incorporating plural direction tipping apparatus as claimed in any preceding claim.